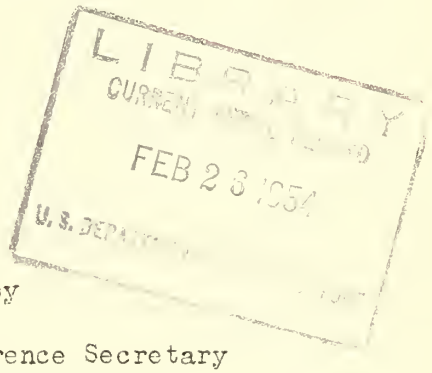
REPORT

of the

SEVENTH SOUTHERN PASTURE AND FORAGE CROP IMPROVEMENT CONFERENCE

May 2 - 4, 1950

A. and M. College of Texas
College Station, Texas



Reported by

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TABLE OF CONTENTS

PROGRAM FOR THE
SEVENTH SOUTHERN PASTURE AND FORAGE CROPS
IMPROVEMENT CONFERENCE

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Tuesday, May 2, 1950.

8:15 A.M. - Registration, YMCA Chapel

R. C. Potts, Chairman

8:45 A.M. - Welcome - Dr. R. D. Lewis, Director, Texas Agricultural Experiment Station

9:00 A.M. - You Are Now In Texas - Dr. R. L. Donahue, Extension Agronomist, Texas

C. R. Owen, Chairman.

9:30 A.M. - State Reports

10:00 A.M. - Recess

10:10 A. M. - State Reports

11:30 A.M. - Planting and Harvesting Native Grass Seeds, Prof. Roy W. Chessmore, Oklahoma A. and M. College.

12:00 N. - Lunch

1:30 - 4:30 P.M. - Field Trip.

5:00 - 7:00 P.M. - Tour of Campus and Dinner in the Mess Hall, Student Section, A.S.A. in charge.

Evening Meeting R. C. Potts, Chairman

8:00 P.M. - African Safari - Dr. M. A. McCall, U.S.D.A., Asst. Chief, Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Maryland.

Wednesday, May 3, 1950.

C. R. Owen, Chairman

8:30 A.M. - Report of the World Grassland Conference - Dr. W. M. Myers, Head Agronomist in Charge, Division of Forage Crops & Diseases, BPISAE, Beltsville, Maryland.

9:30 A.M. - Report of Range Management in South America, Livestock Management in Argentina and Uruguay, by D. W. Williams, Vice Chancellor for Agriculture, Texas Agricultural Experiment Station.

10:20 A.M. - Recess

10:30 A.M. - Control of Shrubs with Herbicides, C. E. Fisher and D. W. Young, Agricultural Experiment Station, Spur, Texas.

11:00 A.M. - Breeding Forage Sorghums for the South - J. R. Quinby, Agricultural Experiment Station, Chillicothe, Tex.

11:30 A.M. - Round Table Discussion - Fertilizer Research With Forage Plants.

Leaders: J. E. Adams, Head, Department of Agronomy, Texas A. and M. College
J. C. Smith, Agricultural Experiment Station, Tex.
L. C. Kapp, Agricultural Experiment Station, Tex.
Audience Participation.

12:10 P.M. - Lunch

1:30 - 4:30 P.M. - Field Trip

6:00 P.M. - Barbecue

May 4, 1950

8:00 A.M. - Leave College Station for Substation #5, at Temple, Texas, and arrive at 10:00 A.M.

SEVENTH SOUTHERN PASTURE AND FORAGE CROPS IMPROVEMENT CONFERENCE

College Station, Texas
May 2-4, 1950

Tuesday, May 2, 1950

8:30 A.M. - Registration YMCA Chapel

R. C. Potts, Chairman

Following registration, the Chairman called the conference to order. Dr. R. D. Lewis, Director of the Texas Agricultural Experiment Station, welcomed the group to the Texas conference. He stated that the activities and responsibilities of this group were potentially greater than we realize in terms of the agricultural development of the South. According to Dr. Lewis, to develop a sound forage program, the following eight points must be included in the scope of activities: (1) a project must be established for the introduction and maintenance of new and basic plant material that may be used, (2) basic studies into modes of reproduction and inheritance, (3) the breeding of adapted plants, (4) basic studies of physiological backgrounds of forage species with particular reference to growth phenomena, (5) management problems, (6) more intensive studies into seed production, (7) studies of seed development as affected by the hazards of environment and soil conditions, and (8) utilization of forage crops in cropping systems.

The broad program of the Texas Agricultural Experiment Stations was presented. Members of the Texas Agricultural Experiment Station staff present at this opening meeting were introduced to the conference group by Dr. Lewis.

9:00 A.M. - You Are Now in Texas, by Dr. R. L. Donahue, Extension Agronomist, Texas Agricultural Experiment Station.

Dr. Donahue explained to the Conference group the rationality back of some of the seemingly extravagant allegations attributed to or as reported by Texans. The complexity of agricultural research problems arising because of differences in rainfall, length of growing season, systems of farming, temperatures, and soils as affecting plant adaptation, were discussed by Dr. Donahue. At the conclusion of the talk the representatives of the other southern states were undoubtedly convinced that all of their particular problems, plus those common to the Southern Great Plains, could be found at some place within the confines of Texas.

9:30 A.M. - State Reports. C. R. Owens, Chairman

Alabama - T. H. Rogers and E. M. Evans.

The acreage of reseeding crimson clover in Alabama has increased to approximately 1,820,000. It is believed that the late freeze of last month will seriously reduce the seed yield of this year's crop. Results of clipping tests show that forage yields of six different strains of reseeding crimson clover do not differ significantly; either in earliness of production, or in total growth.

Sericea is continuing to give good results in Alabama. Preliminary work is under way to collect source material for a tannin study with sericea.

Ladino Clover and Tall Fescue in Alabama

Ladino clover acreage in Alabama has increased considerably during 1949. Part of this increase has been for special purposes such as hog pastures, but most of it has been in combination with tall fescue for general pasture. It appears that on soils where white clover remains perennial, Ladino is equal to or better than Louisiana White clover for production of forage. It does not produce high seed yields, however, and where this is an important consideration, either for commercial seed production or for reseeding of the areas on which Ladino fails to remain perennial, Louisiana White clover is more desirable.

Tall Fescue acreage in the state has shown a rapid increase. The latest estimate of about 50,000 acres is approximately the same acreage as alfalfa. Tall fescue has some characteristics that are desirable in a forage grass along with others that tend to limit its desirability. Preliminary grazing trials indicate that as a winter grazing crop it will maintain beef animals very well. For some reason, however, steers did not seem to make gains in proportion to the amount of fescue available for grazing. Plans are being made to explore this problem further by judicious use of nitrogen as a top dressing and by delayed grazing.

Results of previous work show that annual clovers are more difficult to maintain in a stand of fescue than are perennial clovers. Best results so far have been obtained from a combination of fescue and Ladino on moist, fertile soils. One year's results show fescue to be less competitive with Ladino and Louisiana White clovers than is Dallis grass when measured in terms of vegetative clover remaining in the fall. Ladino remained vegetative with fescue to a greater extent than did Louisiana White clover.

Arkansas - A. M. Davis

Sudan grass breeding is confined largely to the development of Helminthosporium resistant, perennial types of Sudan grass. Attempts are being made to breed the perennial habit into Sudan grass by the use of Sudan grass-Johnson grass hybrids. A highly fertile tetraploid Sudan is being tested this year for the first time. The grass breeding program includes Bermuda grass, orchard grass, fescue, timothy and some redtop. The seed supply of Upland Reed canary grass is being increased this year. Alfalfa breeding is aimed at the development of a procumbent fibrous-rooted variety that will withstand grazing. A search is being made for a mildew resistant red clover and a white clover of the Ladino type that is resistant to the relatively hot, dry summer conditions.

Florida - G. B. Killinger and G. E. Ritchey.

Research on forage and pasture plants in Florida is being conducted in cooperation with the Bureau of Plant Industry, U.S.D.A., at the Main Station, Gainesville, Florida, and at four branch stations, two field laboratories and by four mobile units.

Chief emphasis is being given fertilization, new varieties, management and plant breeding.

Argentina Bahia, a new Bahia introduced by the Department of Agriculture from Argentina, has given all indications of superiority in herbage production, seed viability, rapidity of sod formation and palatability. Presence of excess ergot at present appears as its most serious objection. Preliminary grazing trials, clipping tests and laboratory analyses all appear favorable.

Red clovers, Kenland, Midland and Louisiana, are all making exceptional growth from Central to North Florida and, except for considerable mildew, appear resistant to disease. Honey bees increased the yield of seed of these red clovers at Gainesville from 11 to 58 pounds of seed per acre and with wild bees and bumble bees in addition to honey bees, the yield was further increased to 84 pounds per acre.

A Florida strain of Hubam clover, Melilotus alba, is being increased and shows superiority to the commercial Hubam in its hardiness and ability to grow on droughty sandy soils.

Pangola grass, Digitaria decumbens, has been the most outstanding contribution in grass to the state in a number of years. Approximately one half million acres are now grown. Early and late hairy indigo strains have been acclained by cattlemen for grazing and hay in late summer and fall, with thousands of acres being planted annually.

Selection and breeding of sweet lupines, hairy indigo, Hubam clover, black medic and lespedeza are under way.

Burning of native grasses, liming, fertilizing and seeding to clovers continues to be a successful means of establishing new pastures. Bahia, Bermuda, carpet and Pangola grasses, all grown in combination with white Dutch clover, give increased growth of clover and grass if burned in October each year.

The adaptation studies of recently introduced forage and cover crop plants is being continued, with the result that several interesting strains of grasses and legumes are now under observation in several experiment stations over the state.

A catalogue of grasses and legumes comprising over 5000 individual accessions which have been under observation on the Florida Station, is in the process of being assembled for publication.

Considerable research is under way relative to production of quality grasses and legumes in quantity for artificial drying to supplement the winter feed supply in Florida. Nitrogen studies on Bahia, Pangola and Bermuda, using from 30 to 480 pounds of N per acre, have been initiated in hopes of producing high protein and high tonnage of these grasses.

Georgia - O. E. Sell, G. W. Burton and J. L. Stephens.

Georgia Mountain Experiment Station, Blairsville, Ga.

A spring planting of Ladino clover seed sources showed no marked differences between seed sources in either the first or second year. "Black-patch" disease was quite severe on all plots during the summer of 1949.

Over 70 lines of smooth bromegrass from Dr. Atwood, at Cornell, are under observation. Helminthosporium bromi was present to a variable extent but clear-cut resistance to the disease was not discerned. In the Piedmont Section this disease greatly limits the production and liveability of this grass. Enormous variations in forage production, growth habits and in other characteristics were found in these lines. Most of the lines are themselves highly variable. Attempts are being made to purify and multiply those lines that appear promising. Seed production was poor on the young plants in 1949 but prospects for seed production with some lines look better on the older plants in 1950.

Dairy cows with moderate milk producing ability have been grazed on tall fescue-Ladino clover. A satisfactory rate of milk production has been obtained, even with light or no concentrate feeding.

Coastal Plain Experiment Station, Tifton, Ga.

The new Star millet produced 50 pounds more beef than common pearl millet. It is more leafy, supplies grazing about one month longer and is easier to manage than common millet. Seed of this new variety is available for testing.

Tift 57 is proving to be an outstanding strain of Bermuda for turf purposes.

Over a 3-year period Coastal Bermuda has produced one ton of dried hay per acre without nitrogen and 8 tons with 400 pounds of nitrogen top dressing per acre annually. The crude protein content of the hay was doubled by the treatment. In feeding trials, this nitrogen fertilized hay gave better results than peanut hay of good quality. The high potential production and feeding value of Coastal Bermuda is at least a partial answer to the winter feeding problem.

Anhydrous ammonia has been used successfully as a source of nitrogen for Coastal Bermuda. Lupines drilled into the sod tripled Bermuda production on sandy soil, while clovers have stimulated the Bermuda similarly on heavier soils.

In piney woods pasture experiments on poor sandy soils, the initial objective was to try and find pasture species adapted to these soils. It was found that fertilizers and lime were needed for most species to succeed. It is necessary now to determine whether livestock production in reseeded cut-over timberlands is economical, considering the costs.

Experiment, Georgia, and cooperatively.

Introductory nursery - some 75 forage species and varieties are under observation.

Lespedeza sericea selections for low tannin content - have 60 lines with less than 5% tannin.

Alfalfa - have 350 selections under observation for disease resistance, higher forage yield and seed yields and better general adaptability to the Southeast.

Dixie reseeding crimson clover was first released in 1945. To date 70,000 pounds of foundation seed has been distributed to farmers in 10 southern states and 3 foreign countries. Georgia now has 523,000 acres for grazing and seed production.

Oat breeding for forage - 50 varieties and hybrids are in a 3-year old clipping test. Some hybrids have produced 1½ tons dry forage per acre and 70 bushels of grain following forage harvests.

A cattle weighing scale was designed and constructed by the Georgia Tech Experiment Station. This scale can be dismantled, hauled conveniently on a 3/4-ton or even a ½-ton truck and set up for weighing cattle at outlying experiments. The scale has been in use six months and was so satisfactory that 3 more have been ordered for use in various grazing and livestock experiments in Georgia.

Tall fescue grass breeding - some 10,000 space-planted fescue plants from numerous sources are under observation. About 80 highly variable plants were selected and placed in a replicated strain test. A similar test is being conducted cooperatively by Dr. Burton on Coastal Plain soil. Some 67 Rhizoctonia solani isolates that vary greatly in virulence have been made, also various isolates of Helminthosporium dictyoides. While some fescue lines appear at least partially resistant to Rhizoctonia in the field, all fescue lines have been slightly susceptible to the virulent isolate of Rhizoctonia. The fescue plants under study generally show great variability in many plant characters.

White clover breeding - some 60 variable plants were selected and placed in a replicated plot strain test for further study and selection. Numerous diseases have been found, of which Sclerotium rolfsii appears most serious in reducing clover stands.

New Grazing experiments:

Nine 5-acre pastures were established in north Georgia to determine the relative productivity of various pasture mixtures; also of irrigation.

The relative productivity and value of three types of winter pastures (temporary, fescue-clover and reseeding crimson) are being determined with beef cows in one location and with yearling steers in two locations. In some instances grain or hay is fed to half the cattle on the pastures.

Best pasture utilization with fall-dropped versus spring-dropped calves is being determined with a herd of 55 beef cows.

Kentucky - E. N. Fergus

The report of pasture and forage work in Kentucky is essentially the same as for 1949; strain testing and improvement, pasture management, and determinations of nutritive value of species and varieties for pasture, hay and silage.

Considerable time and work is involved in strain testing. Well adapted varieties, as measured in these tests, are recommended to farmers. When no good varieties are found, the effort is made to develop them by selection and breeding. At present, breeding programs are getting under way on Kentucky bluegrass and orchardgrass, with continued work on tall fescue. It is hoped that studies under way involving interspecific crosses and selection within the fescues will result in better adapted strains of this species. Red clover continues to be the principal legume in our breeding program. Kenland, developed in cooperation with the Department of Agriculture, is a product of this work.

In the pasture production and management studies, variations in fertilizer placement have not affected yields. Surface and subsurface applications have been equally productive. More thorough studies of pasture mixtures are needed at this time.

Louisiana - C. L. Mondart, Jr. and E. C. Bashaw.

The pasture and forage crop research program at the main station, at Baton Rouge, as conducted, may be divided into two phases. These are: (1) breeding of grass and legumes and, (2) the evaluation of new introduced species and strains of crops for forage and seed production.

The breeding program has been under way with Dallis grass since 1942 and has resulted in the development of two strains which are being released after this season. During the testing period at Baton Rouge these strains have proved to be superior in seed setting. The seed samples have a lower percent of ergot-infected florets; consequently they should be more desirable for pasture, especially where ergot poisoning may be a problem. Some improvement has been noted in forage over native Dallis grass. During the past two years more attention has been given to specific problems of fertility pertaining to seed formation in the different lines isolated.

The program with legumes include white clover, red clover and lespedeza. Progress is made toward the development of superior strains of native white clover as well as red clover. Special studies are being made with general and specific combining ability of clonal lines in white clover. Two experimental synthetic combinations have been made and the results of their performance in forage production is promising. Two new strains of red clover are on test this year for the first time.

Specie and strain tests have revealed some very promising new material for pastures in Louisiana. This program is only in its second year. No white or red clover varieties or strains have been introduced which appear to be equal to the native Louisiana strains for forage or seed production. There appears to be a great need for adapted cool season grasses which will grow in

combination with white clover. The tall fescue strains perhaps are not so well adapted as they were thought to be earlier.

Forage and pasture production programs are under way at each of the seven branch stations but the work is new at most locations. Pasture research in the rice area at Crowley is more advanced than at the newer stations. Excellent programs have been started at DeRidder, Shreveport, Homer and at Franklinton. Franklinton is in the New Orleans Milk Shed area and the pasture program obviously is concerned mainly with dairying. The St. Joseph station has done considerable work with pasture establishment in the Mississippi River bottom lands. Perhaps the greatest problem in the alluvial areas is the efficient utilization of the quantities of forage produced.

Mississippi - H. W. Bennett and P. G. Hogg.

A. Plant Breeding.

1. Dallis Grass Improvement - Of 3776 F_2 plants from a Paspalum dilatatum X P. malacophyllum hybrid, 3431 were of the dilatatum type, 246 were as the F_1, 79 as Vasey and 20 were semi-spreading. Seed of the selfed dilatatum type F_2 plants showing some resistance to ergot in 1948 were germinated and plants spaced in the field in 1949. Of the 7427 F_3 progeny, 7291 were of the dilatatum type, 79 as Vasey and 57 as the F_1. Only 7 plants of the entire F_2 and F_3 progeny grown in 1949 were resistant to ergot. One F_3 line was increased in 1949 on the basis of its seed production and some resistance to ergot.

2. Johnson Grass - Three and seven tenths (3.7) percent of the lines clipped in 1948 had been destroyed in 1949 in addition to the 30% eliminated by two years' clipping, ending 1948. One line is being increased for distribution which is self-fertile, tolerant to cold, persists after mowing and is a heavy yielder.

3. Johnson Grass-Sorghum Hybrid - Rigid selection was made during 1949 for juiciness within F_4 and F_5 perennial types. Juiciness was determined in the hard dough stage by twisting a culm 180. Plants were classed as pithy if juice did not run with this half twist. Of a population of 6173 F_4 segregates, 474 or 7.7 percent were juicy. Two hundred forty-nine, or 3.6 percent, of the 6896 F_5 segregates were juicy. Fifty percent of each generation were the sorghum type.

4. Crimson Clover - Selection of crimson clover for hard seed and resistance to foliage diseases has resulted in 1022 strains. Twenty-four percent of the population yields 30-50% hard seed, fifty-four percent 50-70%, and twenty-two percent 70-85% hard seed. Resistance to pseudo-blotch is less than 10%. One late maturing strain is being increased. This strain shows resistance to pseudo-blotch.

5. Weevil Resistance in Cowpeas - Seed from progeny of a Calico X Blackeye cowpea hybrid have been stored in open manila bags from fall to spring each year. Those seed not punctured by weevils have been planted each year. Weevil resistance has ranged from none to 63.6%. Resistance does not seem to be correlated with any color type produced.

6. Alfalfa - Three hundred twenty-nine selections have been made in alfalfa for seed production under humid conditions. One hundred three of these were upright and high forage yielding. Twenty-three were white flowered. Seed yields ranged from 0.5 to 12.0 grams per plant. These seed yields are considered good for 1949 because over 50 inches of rain fell before July 1.

7. Black Medic - Pollination and fertilization studies have shown that this crop is highly self-fertile. Types have been isolated having stigmas protruding through the keel so that cross pollination is necessary for seed set. Selections for type have been made.

8. Red Clover - Kenland red clover was grown in greenhouse benches and mildew infected. Seven hundred fifty mildew-free plants were obtained from 3 pounds of Kenland seed.

B. Pastures.

1. Fertilizer Placement - Machines developed by T.V.A. and the Agricultural Engineering Department of Mississippi State College were used for placing phosphate and 0-14-7 fertilizers in pasture sods. Spacings were 8, 12, 16 and 24 inches apart and 3, 6 and 9 inches deep. No significant differences between these machines and topdressing have been obtained.

2. Species for Grazing - A statistically designed experiment testing 6 plants and mixtures has been started but with no results to date. Mixtures for winter grazing are being conducted at all stations.

C. Variety testing has been conducted with crimson and red clovers, lespedeza and alfalfa.

North Carolina - W. W. Woodhouse

1. Alfalfa Root Studies - Continued root studies in various parts of the state including Coastal Plain, Sandhill, and Upper Piedmont Soils.

2. Initiated studies on the value of phosphate levels in plants as related to their nutritive value.

3. Continued studies on pasture evaluation techniques including:

   a. Shape of cage
   b. Size of cage
   c. Number of cages
   d. Length of rotation
   e. Evaluation of a discrepancy found between the pasture yields as measured by cages and animals on rotational plots.

4. Ladino - Intensified work on Ladino-grass management with particular emphasis on the accumulation of forage for winter grazing. Plan to study water relations of Ladino-orchard and Ladino-tall fescue.

5. Alfalfa - Initiated management studies with particular reference to utilization of fall growth. Found that tall fescue suppresses alfalfa growth much more than orchard grass. Found that stand losses occur principally during the late summer period. Believe that Rhizoctonia and Fusaria were the principal organisms involved.

6. Big Trefoil - Continuing management and small amount of selection of big trefoil. Still having difficulty with Rhizoctonia but this is no more serious in plots than it is under grazing.

Oklahoma - R. A. Chessmore

Pasture conditions in Oklahoma were excellent in 1949 until late in the fall. Since that time one of the driest winters and springs in history has been experienced. Fall-planted legumes and grasses have suffered severely from drouth and heaving. Many of the spring-planted strains lack enough moisture for germination.

The breeding and selection program has been enlarged to some extent. The major emphasis is on sweet clover, lespedeza, alfalfa, smooth brome, Bermuda, switch grass, little bluestem and Sudan grass. Some selection work is being done on lotus, hop clover, white clovers, vetch, buffalo grass, purple top, Turkestan bluestem and Caucasian bluestem.

Turf investigations are being continued with money provided by the Oklahoma State Golf Association.

Pasture establishment and grazing studies are being conducted at several locations over the state. A pasture fertility station at Coalgate, in southeastern Oklahoma, has demonstrated the value of fertilizers on different grass and legume mixtures. Fertilization of native pastures has not proven economical in western Oklahoma because of low rainfall.

Oklahoma is producing a large amount of certified Oklahoma common alfalfa and a moderate amount of foundation, registered and certified Buffalo alfalfa.

An intensive breeding and selection program is being conducted at the Southern Great Plains Field Station, Woodward, Oklahoma, by Dr. J. R. Harlan. Major emphasis is on the western grasses such as blue grama, sideoats grama, buffalo grass, sand bluestem, sand lovegrass, switch grass, Turkestan bluestem and Caucasian bluestem. The station is also conducting extensive grazing tests with several grasses under different grazing practices.

Puerto Rico - P. Gonzales Rios.

Progress is reported in evaluating strains of grasses and legumes for forage in Puerto Rico. A broad collection of species are included in the studies at several locations. Guinea grass, Panicum maximum, continues to be a most productive species. Yields of 42 tons of green herbage containing 6.8% protein were obtained. Coastal Bermuda produced 20 tons containing 8% protein. Tropical kudzu, Pueraria phaseoloides, continues to be particularly promising in association with the grasses. The development of species or

mixtures having a higher protein content is of major importance in the tropics. Para grass, Pennisetum purpureum, alone contained only 4.5% protein while the protein content of a mixture of Para grass and tropical kudzu was 10.05%. Animal gains from the mixture were much greater than from either species alone.

South Carolina - W. R. Paden

The forage activities have been largely concerned with promotion of a winter grazing program over the entire state, using tall fescue and Ladino clover. Proper liming of the soil and heavy rates of fertilization with phsophate and potash and using some nitrogen, such as contained in a 3-12-12 analysis for establishment, followed by additional nitrogen as top dressing, have produced excellent pastures, especially on the heavier soil types. Some crimson clover-ryegrass pastures seeded alone and in combination with Bermuda grass pastures have also proven very successful.

The reseeding characteristics of various strains of crimson clover are being studied at different locations. Legume and grass nurseries are also being used for adaptation and yield studies.

Texas - R. C. Potts, Clark Harvey and E. C. Holt.

Grass Investigations - Tests of species and strains of both warm and cool season grasses are being conducted. Cool season tests are under way at nine locations. The tall fescues appear most promising at most locations with the smooth bromes showing some promise at higher elevations and Harding grass in central sections of the state. Warm season tests have been initiated at 10 locations in the state.

An introduction nursery is being maintained for studying new species and strains of grasses for forage production and for potential breeding material. A number of new species appear to have promise for use under certain conditions and are being included in larger replicated tests.

Breeding - Emphasis is being placed on three species, two native and one introduced. Work with Buffalo grass is toward a type which sets seed higher from the ground, which is more dense and vigorous. Some progress has been made toward these objectives. Work has been initiated toward the improvement of Stipa leucotricha, a cool season native, and Bermuda grass.

Legume Investigations - Species of legumes are being evaluated for forage and seed production, forage quality, stand longevity, summer survival, seasonal growth, vigor of recovery after defoliation and resistance to diseases, insects and drouth. Tests are being conducted at 18 of the substations as well as at College Station. Variety tests of alfalfa, sweet clover, crimson clover, . . trefoil, vetch and bur clover are also a part of the program at these various locations. Studies are being conducted to determine the effects of rate of seeding, row spacing, companion crops and fertilizers on vetch seed production.

Some of the legume species or varieties that have looked very good are Indian, Williamsburg, African and Atlantic alfalfa; Madrid and Evergreen sweet clover; Tennessee Wilt Resistant redclover, Berseem, Persian and

Subterranean clover. A selection of Medicago tuberculata has yielded considerably more forage than other annual Medicagos. There seems to be very little difference in forage production among the crimson clovers.

Studies are being made at three locations of the fundamentals of growth and management of soil-improving legumes. Measurements are taken of both tops and roots to evaluate the legumes for forage and soil improvement. One of the objectives is to determine the effects of frequency of clipping on root-top ratios, nitrogen content of roots and tops and organic reserves in the roots.

Grazing Trials - Grazing trials are being conducted at College Station to determine seasonal use of certain perennial warm season grasses grown in conjunction with bur clover.

At Temple an effort is being made to determine the income that is being made from grazing small grain and sudangrass, sweetclover, fescue and warm season perennials.

At Beeville, Texas, in the 30-inch rainfall area, small grains and sudan grass are being used to produce beef as compared with native range plants.

At the station at Angleton, livestock are being used to measure fertilizer treatments.

At the Beaumont Station, the livestock-rice system is being worked out in an effort to determine the place of improved pastures in rotation with rice.

At the Lufkin Experiment Station, livestock are being used to determine the effect of various fertilizer treatments on a mixture of white clover, Dallis grass-Bermuda pasture.

Virginia - R. E. Blaser.

The forage crop investigations are now carried on under the direction of two divisions of the Agronomy Department:

1. The breeding and varietal investigations are carried on under the direction of Dr. T. J. Smith.

2. Phases of research concerned with grazing management and mixtures are carried on under the direction of R. E. Blaser. The fertility phases are being conducted jointly by several members of the Agronomy staff.

The V.P.I. personnel that spends its time exclusively with forage crop investigations includes:

Mr. Roy Hammes, Mr. Timothy Taylor, Dr. Willis Skrdla, Dr. T. J. Smith and R. E. Blaser.

In addition to this personnel, several animal scientists and the Assistant Agronomists at the field stations are cooperating with various forage crop projects.

The forage crop breeding investigations are limited largely to work with alfalfa, red clover and orchard grass. The primary objectives are to obtain disease resistant varieties. The many diseases that affect alfalfa and red clover limit productivity and diminish longevity. The Plant Pathology Department cooperates very closely with these breeding investigations.

Variety tests are being established in various places in Virginia to ascertain the best genotypes among strains of red clover, alfalfa, orchard grass, tall fescue, crimson clover, brome grass, ladino clover and white clover. Experiments have been established to ascertain the adaptation of birdsfoot trefoil under Virginia conditions. In this project, various genotypes of Lotus corniculatus and L. uliginosus are being studied under inoculation treatments and with various plant associates.

The projects associated with pasture fertility, management and grazing investigations include the following:

1. The value of plant species and mixtures when grazed by beef cattle.

Orchard grass and Kentucky 31 fescue are being tested in pure stands and with ladino clover. The other treatments include a permanent pasture mixture and a mixture of orchard grass, redtop and Korean lespedeza. The primary objective of the experiment is to test the nutritional value of the species and/or mixtures. Dr. C. M. Kincaid of the Animal Husbandry Department is cooperator.

2. The yield, seasonal distribution, and quality of herbage from alfalfa, ladino clover, and orchard grass in various mixtures under different cutting practices.

3. Competition for potassium and other nutrients among plant species.

4. The effect of fertilization on the yield, maintenance and composition of forage species when grown alone and in mixtures.

5. The relationship of grazing management to dry matter intake and milk production of milk cows and growth of yearling heifers. The Dairy Department is to cooperate with this project.

6. The value of three mixtures(orchard grass, ladino clover, alfalfa-orchard grass, Kentucky 31 fescue-ladino clover) for milk cows. This is a dairy project, the Agronomy Department cooperating.

7. The Animal Husbandry Department is cooperating with one of the field stations to ascertain the value of ladino clover for pigs.

11:30 A.M. - Planting and Harvesting Native Grass Seed, by R. A. Chessmore, Agronomist, Oklahoma A. & M. College, Stillwater, Oklahoma.

Native grasses for pasture and hay are very important in the Great Plains area of the United States. They are well adapted to this low rainfall area where the summers are hot and dry and the winters cold and windy.

The Great Plains area has 1/3 of the land area and produces 1/3 of the beef cattle of the United States. Thirty to fifty percent of the area is in native pastures. A high percentage of these are overgrazed, weedy and in need of reseeding.

The Great Plains may be divided to about the 98th meridian into the Eastern Tall Grass Section and the Western Short or Mid-grass Section. The most important tall grasses are big bluestem, little bluestem, switch grass and Indian grass. These grasses require more moisture than the short grasses and are well adapted to the acid soils east of the "lime-line".

The most important western native grasses are blue grama, buffalo grass, sideoats grama, sand lovegrass, sand bluestem, western wheatgrass, Texas bluegrass, wild ryes and stipas. They are drouth and heat resistant and require special seeding methods.

Planting Native Grasses

The planting of native grasses is more complicated because of the many different land types that must be reseeded. The sagebrush, mesquite, chapparel and scrub oak areas of the West and the rocky, eroded broomsedge or woodland areas of the East are of major importance. Different seeding methods and grass mixtures are used in each problem area.

In Western Oklahoma the land is usually prepared for seeding by using the sorghum stubble-mulch method developed at the Southern Great Plains Field Station, Woodward, Oklahoma. The sorghum is cut high before heading and the grass seed drilled in the soil without further preparation. Weed infestations and wind erosion are cut to a minimum by this method: As seedings are made farther east the amount of sorghum left on the ground is reduced until in eastern Oklahoma the grass may be planted on clean cultivated land. On land that is steep and very erodable the native grasses are sometimes drilled in or sowed broadcast.

The light and chaffy nature of native grasses make their seeding quite difficult. Purity and germination are usually low and practically no pure seed is available. Special drills must be used to do a satisfactory job of seeding. A good grass drill should:

1. Feed uniformly.
2. Place the seed at the proper depth.
3. Be adjustable to rates.
4. Compact the soil over the seed.
5. Operate efficiently in a mulch.

Some of the first native grass seeders were remodeled grain drills equipped with agitators. Later, gangs of cotton boxes were used successfully. For small seeded grasses such as weeping and sand lovegrass the Planet, Jr. drill boxes were used.

Experiments show that native grass seedings may take 2 to 5 years to become well established. Weeds are usually mowed the first 2 years with light grazing starting the second year.

Harvesting of Native Grass Seed

Harvesting of native grass seed has become widespread in recent years. In 1948, over 2 million pounds of bluestem seed were harvested in Oklahoma. This was an exceptionally good year for seed production. The amount dropped to 350,000 pounds in 1949. The yields of native grasses are usually not very high. Under cultivation little bluestem and switchgrass will make 200 to 300 pounds, while blue grama and sand lovegrass will make 100 to 200 pounds.

Native grasses are considered to be worthy of harvest if the percent fill is: Switch 40%, little bluestem 30%, blue grama and sand lovegrass 25%, big bluestem 20% and side-oats grama 10%.

Native grasses may be harvested in several different ways. The most common one is by combine. Rubber-faced or rasp bar cylinders are usually used. The cylinder speed is reduced to 800-900 R.P.M. and set to a very close clearance. The air is shut off or the fan removed.

Seed may also be harvested by use of the binder, mower, strippers, windrower lawn mower, air blast or by vacuum machines.

After the seed is harvested it may be partially or completely processed by the use of a hammermill. The speed should be reduced and the hopper kept full to get a rubbing action instead of a grinding action. Oblong screens should be used for most native grass seed.

Experiments have shown that completely processed native grass seed does not store as well as clipped or unprocessed seed.

12:00 N. - Lunch.

1:30 - 4:30 P.M. - Field Trip.

A tour of the station was made and the plan of work, objectives and the results of investigations were presented to the group by members of the station staff. Investigations under way included: Cool-season grass-legume tests, fertilizer tests with Coastal Bermuda, a factorial experiment on over-seeded sod and the grass and legume nurseries.

5:00 - 7:00 P.M. - Tour of Campus and Dinner in the Mess Hall, Student Section, A.S.A. in charge.

Evening Meeting — R. C. Potts, Chairman

8:00 P.M. - African Safari - Dr. M. A. McCall, U.S.D.A., Assistant Chief, Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Maryland.

Dr. McCall returned October 15, 1949, from Africa where he spent three months on an ECA mission. This survey was made at the request of the British Colonial Office as a part of the Marshall Plan program. Objective was to assist the Colonial Office in a study of opportunities for research projects on the utilization of resources that can be used to supply food and industrial materials for the colonies and the British Commonwealth.

Dean W. V. Lambert of the Nebraska College of Agriculture, headed the mission, and Dr. M. G. Cline, Soil scientist of Cornell University, was a member. The American scientists crossed the continent, visiting Kenya, Uganda, Tanganyika, Northern Rhodesia, Southern Rhodesia, Nyasaland, Nigeria, and the Gold Coast. Accompanied by colonial officers, including the director of agriculture in each area, they were given an opportunity to observe agricultural practices, to inspect research facilities, and to become acquainted with the problems calling for research.

Dr. McCall pointed out that more than 90 percent of farming is on small holdings and the work is done entirely with hand labor. All research planned must be designed not only for large modern facilities but also to make effective use of present systems of small holdings and to fit in with tribal government. They should require very little investment by the small farmer.

The most serious problem, according to Dr. McCall, is a shortage of trained personnel for research work. Projects recommended for ECA support will very likely include the assignment of American scientists to help in organizing the work and to train others to carry it on. Dr. McCall illustrated his talk with slides showing the various areas covered in the survey.

Wednesday, May 3, 1950. C. R. Owen, Chairman

8:30 A.M. - Report of the World Grassland Conference - Dr. W. M. Myers, Head Agronomist in Charge, Division of Forage Crops & Diseases, BPISAE, Beltsville, Maryland.

The Netherlands has the densest population of any country in Europe with an average of 272 people per km^2. In contrast to densely populated areas of Asia, the Dutch have not adopted a predominately cereal diet. Instead, they remain extensive producers and users of livestock and especially of dairy products. Permanent grasslands occupy 55% of the total arable land of the country. In developing and supporting a dairy farming enterprise, the Dutch have learned two things not yet well accepted in the United States, namely, (1) that high levels of dairy production are possible with high quality forage supplemented with only small amounts of concentrates, and (2) that improved grasslands will produce more abundant nutrients per acre for livestock than will other feed crops. This knowledge, plus soil and climatic conditions conducive to production of forage crops, has led to the development of grassland farming on a large scale in the Netherlands.

The dairy cows are kept on pasture for about six months out of each year, during which time they receive no concentrates or other feed. They are kept in the pasture constantly, even for milking. During the remaining six months the cows are kept continuously in the barn where they are fed hay and silage from the permanent grasslands, fodder from arable lands, and some concentrates. In contrast with the United States, cows, horses, and sheep in the Netherlands receive an average of 68 percent of their nutrients from permanent grasslands and only 17 percent from concentrates. Average production of this level with little feeding of concentrates may be attributed in large part to the high quality of the forage and of the cows.

The best permanent grasslands of the Netherlands are considered to be those composed predominately of perennial ryegrass. Few legumes are found and there is little concern with maintaining legumes. Production at high levels is maintained by fertilization including high rates of nitrogen. Although the average rate of application of commercial nitrogen fertilizers is 25 pounds of nitrogen per acre, applications of 100 to 150 pounds are common, and some farmers are using as much as 250 pounds of nitrogen per acre. Great care is taken in preservation and use of the farm manures which are also returned to the grasslands in considerable quantities. High quality of forage is maintained by grazing and mowing at immature stage. With the high levels of nitrogen the immature perennial ryegrass is, according to the Dutch scientists, (1) high enough in protein for adequate nutrition, (2) higher in energy value than comparable forage containing legumes and (3) capable of producing more TDN per acre than a grass-legume mixture. Despite the current emphasis on pure grass, the Dutch are searching for productive legumes that will persist and produce in stands with grass at the high levels now possible with nitrogen fertilization. Rotational grazing is practiced on all of the better farms, the extreme being cases of moving the cows every day.

Forage crop breeding programs concentrate on perennial ryegrass and white clover, with some work also on annual ryegrass, orchard grass, timothy and sweet lupines. Emphasis is placed on strain building with selection for type as practiced by plant breeders of the Welsh Plant Breeding Station.

9:30 A.M. - Report on Livestock and Range Management in South America, by D. W. Williams, Vice Chancellor for Agriculture, College Station, Texas.

Mr. Williams had just returned from a brief tour of the livestock areas of South America. The tour, made up of stockmen from Texas, was sponsored by the Flying Farmers' organization. Stops were made in Peru, Chile, Brazil, Argentina and Uruguay. According to Mr. Williams, all members of the tour were particularly interested in management methods in the production of Argentine beef. Native grass pastures, in general, were not productive. Alfalfa and small grains were the main pastures where grass-finished animals are produced. Steers for finish get a first choice in a rotation system of pasture management. Pastures are plowed every 5 years and reseeded with alfalfa. Only 15% of the grazing lands are grass. Shorthorns, Aberdeen-Angus, and Herefords are the important breeds in Argentina. Mr. Williams illustrated his talk with a number of slides which gave the group an excellent picture of the grazing lands, livestock breeds, and farm structures of the countries covered in the tour.

10:20 A.M. - Recess.

10:30 A.M. - Mesquite Control Investigations, by C. E. Fisher and D. W. Young, Agricultural Experiment Station, Spur, Texas.

Experimental studies with growth regulator chemicals have shown that 2,4,5-T is highly effective for the control of mesquite (Prosopis juliflora var. glandulusa). Airplane applications of 2/3 pound acid of 2,4,5-T isoprophl ester in 5 gallons of a 20% diesel oil emulsion per acre gave 98% top kill with only 3% of the trees showing weak sprouts 14 months after treatment.

Most effective control of mesquite was obtained when treatments were applied during the full leaf stage in the spring and the plants were actively growing and there was ample soil moisture. During this period excellent control of annual range weeds was also obtained. Treatments at other stages of growth extending from spring to fall dormancy, using various carriers, were less effective. Satisfactory control also was obtained with ground [illegible] spraying equipment when growth of mesquite was 3 to 5 feet tall and actively growing in spring full leaf stage.

Applications of 2,4,5-T ester in diesel oil to the lower 12 inches of tree trunks gave 60 to 90 percent kills when the solutions contained at least 1/2 percent acid and one gallon of the solution was used on 15 to 20 trees. The effectiveness of the trunk treatments appeared to be influenced more by the amount used to saturate the bark than by season of treatment. Even more effective control of mesquite was obtained by applications of 2,4,5-T ester in oil to cut surfaces and bark of stumps after top wood was removed. Four pound solutions of 2,4-D amine applied to freshly cut wood of large trees with a paint brush were also highly effective.

New techniques were developed to determine the mobility of various formulations of 2,4,5-T and other untried chemicals in tissues of mesquite and also to evaluate the amount of absorption of these chemicals by the foliage. These tests show that the amine formulations of 2,4-D and 2,4,5-T are more mobile in the tissues than the ester formulations. The addition of emulsifiable oils or wetting agents increased the mobility of 2,4-D and 2,4,5-T. Absorption of 2,4,5-T and 2,4-D by foliage appeared to be influenced mainly by the stage of growth and temperature following treatment. The ester formulations of 2,4,5-T in water were absorbed more rapidly and in greater amounts than other formulations. Low phyto toxic oils appeared to increase the absorption to 2,4,5-T ester. In grazing trials yearling steers have made 15% more gain over a 5-year period on cleared pastures than on those infested with a moderate stand of mesquite.

11:00 A.M. - Breeding Forage Sorghums for the South, by J. R. Quinby, Agronomist and Superintendent, Texas Substation No. 12, Chillicothe, Texas.

Sorghums for forage are grown on about six million acres in the United States each year. Most of this acreage is in the Great Plains Region but there is an appreciable acreage in each of the Southern States. The acreage might well be larger, especially if there is an increase in the use of silage. At present about one acre out of six is ensiled. The feeding value of an acre of sorghum in the form of silage is about twice as great as in the form of dry bundles. The making of silage is now a mechanized operation and it appears that there is more incentive to increase the acreage of forage sorghum to be put in silos than to be bound, shocked, hauled and stacked. If the acreage of sorghum is to be increased in the Southern States, there is an opportunity to produce better varieties for this region than those at present in existence.

The Texas Agricultural Experiment Station and the Division of Forage Crops and Diseases, U. S. Department of Agriculture, have been interested in the improvement of forage sorghums for about 45 years. This interest has

resulted in the production of sweet sudan grass which is now an important pasture grass. Much other work has not resulted in varieties that are in use at present. As long ago as 1920, Mr. H. N. Vinall of the Division of Forage Crops and Diseases made crosses between sorgo varieties and during the next ten or 15 years selections were made at the Chillicothe Station. This and other plant breeding work resulted in a number of promising strains that were evaluated in yield trials and several of them were increased and distributed on a trial basis. Only one of these strains, an early maturing strain of sumac whose seeds have no testa, was ever planted on any appreciable acreage. The other varieties, although they were high in production, never became established, apparently because their production was greater than farmers were willing to harvest. The results of this work have been a liberal education in what is acceptable to farmers. To anyone who anticipates doing plant breeding work with forage sorghums our experiences might be worth recounting.

It should be realized that a change in farm machines can make an enormous difference in the demands for different varieties. Forage sorghum has been one crop that would produce more than farmers were willing to shock and haul. On that account, most of the new sorgo varieties have been relatively early in maturity, produce less than the varieties in common use, or at least produce no more. The new forage sorghums that have come into existence within the last 20 years have had some particular advantage such as low prussic acid content or palatable seed of low tannin content. High production has not been an item of importance. What the future holds will depend upon the demand for silage. If farmers expand the use of silage, it is possible that high yielding varieties to be harvested with a field cutter might find a place. The most important consideration in undertaking a forage sorghum breeding program should probably be disease resistance. Sources of resistance to the important diseases that affect sorghums are known. Many of the sorghum varieties that are maintained in the sorghum nursery at Chillicothe have been grown at Beltsville, Maryland; Tifton, Georgia; and Gainesville, Florida, and observed for disease resistance. The varieties observed in 1940 numbered about 100 and in 1941 about 300. The disease notes were taken by Dr. C. L. Lefebvre, Plant Pathologist of the Division of Forage Crops and Diseases, and Dr. J. H. Martin and R. W. Leukel of the Cereal Division. The agronomic data were collected by Dr. G. W. Burton, at Tifton, and Mr. G. E. Ritchey, at Gainesville.

The most important disease at Gainesville was Ascochyta sorghina. At Tifton, in addition to Ascochyta sorghina, Colletotrichum graminicolum was an important disease. Notes on Helminthosporium turcicum resistance were taken at Beltsville in 1941. Notes on the common foliage diseases of the Great Plains region which include bacterial stripe, bacterial streak and bacterial spot, have been taken at Chillicothe from time to time and the response of many varieties to the 4 races of smut is known. There is one good publication on sorghum diseases by Leukel, Martin and Lefebvre. It is Farmers' Bulletin No. 1959, Sorghum Diseases and Their Control.

We are therefore in a favorable position in regard to breeding forage sorghums for the South. There are about 500 strains of sorghum growing in the nursery at Chillicothe. At Meridian, Mississippi, the Division of Sugar Plants of the U. S. Department of Agriculture has a large collection of sorghums also. There is, therefore, an abundance of perennial material and a knowledge of what strains carry resistance to the various diseases. It is apparent that the

breeding work cannot be done in the Great Plains area as the diseases that are prevalent in the South are not greatly in evidence in the drier areas. It should not be too difficult to attain the objectives as far as disease resistance and agronomic characters are concerned. To be entirely acceptable, new varieties would have to produce reasonably high yields of seed in the areas of seed production.

It seems to me that there is an opportunity to do a real service to the agriculture of the South by breeding some adapted disease resistant forage varieties. Everything needed is at hand and all that is necessary is to make a start.

11:30 A.M. - Round Table Discussion - Fertilizer Research with Forage Plants.

Leaders: Dr. J. E. Adams, Agronomy Department, College Station, Texas
J. C. Smith Agronomy Department, College Station, Texas
L. C. Knapp, Agronomy Department, College Station, Texas

The main objectives and extent of the forage and pasture fertilization work in Texas were enumerated and briefly discussed by Dr. Adams. A number of well-designed experiments involving amounts and ratios of nutrients as affecting yield, botanical composition and chemical composition are under way at the Texas Station. The 1949 results of these tests were presented to the group by Mr. Smith. In general, the one year's data indicated the need of nitrogen and phosphorus for maximum forage yields on Lufkin fine sandy loam.

At the close of the Round Table discussion the conference group was called to order by Chairman C. R. Owen for a brief business meeting. The Nominating Committee presented the names of R. C. Potts as a new member of the Executive Committee and G. B. Killinger as Chairman for 1951. The nominations of the Committee were approved unanimously. The membership of the Executive Committee for 1951 is as follows:

O. E. Sell	Georgia	(1951)
C. R. Owen	Louisiana	(1952)
G. B. Killinger	Florida	(1953) Chairman
H. T. Rogers	Alabama	(1954)
R. C. Potts	Texas	(1955)
R. H. Lush	Knoxville, Tenn.	Dairy Husbandry
E. H. Hostettler	Raleigh, N.C.	Animal "
P. R. Henson	Beltsville, Md.	Permanent Sec'y.

The Chairman indicated that the conference was open for suggestions as to a meeting place in 1951. An invitation to the conference to meet in Alabama in 1951 from Dr. E. V. Smith, of the Alabama Agricultural Experiment Station, was read by Dr. Rogers. A motion to accept the invitation to Alabama was made and unanimously approved.

In the closing minutes of this last meeting at College Station an unanimous vote of appreciation from conference members was extended to those of the staff of the Texas A. & M. College responsible for the very excellent program and arrangements for the Seventh Annual Conference.

12:10 P.M. - Lunch

1:30 - 4:30 P.M. - Field Trip.

The field trip covered the forage investigations under way on bottom-land soils at the station on the Brazos River. Investigations under way included adaptation studies of grasses and legumes in small plots, summer hardiness and disease resistance studies in brome and tall fescue.

6:00 P.M. - Barbecue

This part of the well-planned program was enthusiastically received - undoubtedly a high point in the conference. Unaware that talks and discussions would develop following the barbecue, the secretary was unprepared to record these enlightening discussions, however, it is believed that a consultation with J. E. Adams would clear up any otherwise obscure points in these after-barbecue remarks. Certainly the excellent barbecue by Dick Potts and his associates placed "Texas Barbecue" in high regard by all.

May 4

8:00 A.M. - Trip to Substation No. 4, at Temple, Texas.

The group assembled shortly before 8:00 A.M. in front of Aggieland Inn for the trip to Temple. Transportation was provided by the Texas Station to those coming by public carriers. The tour left College Station at 8:00 A.M., arriving at the Temple Substation at 10:00 A.M.

Dr. Johnson, Superintendent, met the group at the Temple Station and discussed briefly the objectives of the work of the station. On the black-land soils, the solution of problems of management, rotations, fertilization and erosion control are important to the successful utilization of the soils. Phosphate fertilization has been found to greatly stimulate legume growth. Detailed studies using radio-active phosphorus on legumes, primarily sweet clover, are under way. Both root and top growth was increased by phosphates and, in addition, stimulated the activity of the legume bacteria. Studies of the relative efficiency of strains of legume bacteria on this soil type are under way.

Pasture studies of the utilization and management of various grasses and legumes by grazing with livestock were observed. Various combinations of small grain, sweet clover, tall fescue, Turkestan bluestem, Bermuda grass, Johnson grass and Sudan grass are included in these experiments. A grazing system involving oats and barley in combination with Madrid or Evergreen Sweet clover furnished grazing from November to July; Sweet Sudan from June 1 to August 1, and sweet clover again in August and September.

Southern Pasture and Forage Crops Improvement Conference

College Station, Texas - May 2 - 4, 1950

Name	Field	Institution
J. E. Adams	Agronomy Dept.	Texas A. & M., College Station, Tex.
F. C. Bashaw	Forage Crops	La. Expt. Sta., Shreveport, La.
H. W. Bennett	Plant Breeding	Miss. Expt. Sta., State College, Miss.
G. W. Burton	Grass "	Coastal Plain Expt. Sta., Tifton, Ga.
W. W. Cardwell, Jr.	Professor	Univ. of Houston, Houston, Tex.
Shannon Carpenter	Dairy	Substation No. 2, Tyler, Tex.
R. L. Cheaney	Soil Fertility	Tex. A. & M., College Station, Tex.
Roy A. Chessmore	Pasture Research	Okla. A. & M. College, Stillwater, Okl
E. D. Cook	Forage Crops	Tex. Expt. Sta., College Station, Tex.
L. E. Crane	Research	Substation No. 22, Kirbyville, Tex.
R. W. Cummings	Assoc. Director	N.C. Expt. Sta., Raleigh, N. Car.
Albert M. Davis	Forage Crops	Univ. of Ark., Fayetteville, Ark.
Charles F. Denman	Pasture Management	Okla. A. & M., Stillwater, Okla.
Earl H. DeVane	Grass Breeding	Coastal Plain Expt. Sta., Tifton, Ga.
D. I. Dudley	Superintendent	Substation No. 6, Denton, Tex.
Julius M. Elrod	Forage Crops	Ga. Expt. Sta., Experiment, Ga.
E. M. Evans	Pasture Research	Ala. Expt. Sta., Auburn, Ala.
Nolan F. Farris	Forage - Adm.	Off. of Expt. Sta., USDA, Washington, D.
E. N. Fergus	"	Ky. Expt. Sta., Lexington, Ky.
C. S. Garrison	Seed Production	BPISAE, Beltsville, Md.
Pryce B. Gibson	Plant Breeding	Ala. Expt. Sta., Auburn, Ala.
W. L. Giles	Forage Crops	Miss. Expt. Sta., State College, Miss.
Clark Harvey	Legume Research	Tex. A. & M. College, College Station,
Orve T. Hedden	Agric. Engineer	BPISAE, Beltsville, Md.
Peter G. Hogg	Mgt. & Plt. Breeding	Delta Expt. Sta., Stoneville, Miss.
E. A. Hollowell	Clovers	BPISAE, Beltsville, Md.
Ethan C. Holt	Forage Crops	Tex. Expt. Sta., College Station, Tex.
John S. Horr	Sales Dept.	Armour Fert. Works, Houston, Tex.
Henry A. Johnson	Forage Crops	BPISAE, Poplarville, Miss.
H. W. Johnson	" "	" Stoneville, Miss.
P. R. Johnson	Superintendent	Substation No. 2, Tyler, Tex.
J. R. Johnston	"	" No. 5, Temple, Tex.
G. B. Killinger	Pasture Research	Fla. Expt. Sta., Gainesville, Fla.
Murray L. Kinman	New Oil Seeds	BPISAE, TM & SC, College Station, Tex.
Frank G. Krauskopf	Student	Univ. of Houston, Houston, Tex.
H. L. Lucas, Jr.	Experimental Statist.	N.C. Expt. Sta., Raleigh, N. Car.
D. E. McCloud	Forage Crops	Fla. Agric. College, Gainesville, Fla.
J. B. Moncrief	" "	Rice Pasture Sta., Beaumont, Tex.
C. L. Mondart, Jr.	" "	La. Expt. Sta., Baton Rouge, La.
N. D. Morgan	American Potash Inst.	Shreveport, La.
W. M. Myers	Forage Crops	BPISAE, Beltsville, Md.
C. R. Owen	" "	La. Expt. Sta., Baton Rouge, La.
W. R. Paden	Soils, Forage Crops	S. C. Expt. Sta., Clemson, S. Car.
R. M. Patterson	Pasture Research	Ala. Expt. Sta., Auburn, Ala.
F. J. Pratt	ACP Branch, PMA	Washington, D. C.
J. Roy Quinby	Sorghums	Substation No. 12, Chillicothe, Tex.

Name	Field	Institution
M. E. Rieve	Forage Crops	Substation No. 3, Angleton, Tex.
Geo. R. Ritchey	" "	Agric. Expt. Sta., Live Oak, Fla.
Stephen L. Roberts	Student	Univ. of Houston, Houston, Tex.
T. H. Rogers	Legume Plant Breeding	Ala. Expt. Sta., Auburn, Ala.
V. E. Schember	Adm.	Tex. Expt. Sta., College Station, Tex.
O. E. Sell	Pasture Research	Ga. Expt. Sta., Experiment, Ga.
T. H. Silker	Forestry, Range Res.	Substation No. 22, Kirbyville, Tex.
D. G. Sturkie	Agronomist	Ala. Expt. Sta., Auburn, Ala.
F. M. Trew, Jr.	"	Substation No. 15, Waslaco, Tex.
W. F. Turner	Superintendent	Substation No. 3, Angleton, Tex.
Ed Usrey	Student, Agr.	Tex. A. & M., College Station, Tex.
George C. Warner	Agronomist	Ruhmann Gr. & Seed Co., Waco, Tex.
Ralph M. Weihing	Pasture Research	Rice Exp. Sta., Beaumont, Tex.
John S. Williams	Teaching	Univ. of Houston, Houston, Tex.
B. T. Williamson	Past., Forest., Cattle	Fla. Expt. Sta., Gainesville, Fla.